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Simulation provides deep learning opportunities for medical students intercalating in the biosciences

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INTERCALATION IN THE BIOSCIENCES AND PROJECT WORK

Intercalation in the biosciences is popular with medical undergraduates in the UK and is mandatory at some institutions. It is considered important that medical students develop skills and an interest in innovation and research[1] and is recognised as one way to enhance the knowledge of research methodology.[2] The intercalated year helps to meet these aims by including research project work as part of the core course content. Projects are often practical and laboratory-based, as well as other out-of-laboratory options such as literature review or producing a grant proposal. Projects must fulfil a set of intended learning outcomes, for example, in final-year degree courses in this School: 'deep understanding of a scientific or educational question; the ability to gather information from the scientific and/or educational literature and critically evaluate and appraise competing theories; the ability to present original findings and ideas to a specialist audience'. We offer projects that fulfil these outcomes exploring key areas of integrative, human physiology using high-fidelity human patient simulators.[3] The simulators used here are manikin-based with an integrated and real-time model that provides the ability to explore, manipulate and access key physiological variables important in health and disease.

HUMAN PATIENT SIMULATION PROJECTS FOR INTERCALATING UNDERGRADUATES

Final-year undergraduate students in this school have carried out projects using high-fidelity simulation aimed at design and testing of novel resources for teaching aspects of physiology and pharmacology for a number of years.[3] Now we are offering similar projects but specifically designed with an emphasis on intercalating medical students exploring areas of relevance to key learning outcomes for their own programme, with reference to current learning guidance.[4] Students are given some choice in the area of study. For example, our most recent students explored the underlying physiology of, and created scenarios to accurately simulate, hypothermia and hyperthermia, including malignant hyperthermia. The structure of the project is: a detailed literature search of the underlying human physiology and pathophysiology of the problem or state, culminating in a literature review; experiments with the simulator to assess the responses to stressors/pathologies and refinement of the physiological model of the simulator based on the literature; collection of data from simulated life signs and responses followed by analyses comparing simulated and human data; submission of a written dissertation and an oral communication. Projects are carried out in groups of up to four and duration is around 40 days. An added benefit of adopting simulation projects has been to help in accommodating growing numbers of students and, after the initial investment in hardware, which is often aimed at cohorts other than undergraduates, simulation projects are very cost effective.

LEARNING OPPORTUNITIES

The student perspective

Our detailed exploration of a physiological problem using simulation reinforced core knowledge relevant to medical students, building on previous undergraduate teaching. Working with a high-fidelity simulator helped us gain an understanding of how physiological parameters respond in an integrated way to stressors. This was particularly valuable, inspiring an interest in critical care and likely to positively impact on our later clinical practice. We gained skills in critical thinking, data analysis, communication and use of patient simulators. An understanding of strengths and weaknesses around the use of simulation in education provided insight into our future role as teachers as well as clinicians where simulation provides ever-increasing educational opportunities. Teamwork in the student group was crucial for success: our varied backgrounds and interests enabled us to approach the project from different perspectives. The success of our work gave us the opportunity to present at meetings on simulation and medical education, another key skill for our future careers.

Instructor perspective

Simulator projects are an efficient (several student groups can work online and offline per simulator) and cost-effective (simulator costs are significantly lower in recent years) means of allowing students to gain a research-based experience and fulfil intended learning outcomes of this core part of the intercalated year. Simulations can sometimes provide more readily a rich source of data for analysis, but still satisfy the same requirements for critical thinking, critical analysis of the existing literature (comparison to human data to validate the simulation scenario) and data analysis. As students are dealing with simulated clinical data and life signs, these projects are particularly engaging for medical students and have direct clinical relevance. Analysis of recent performance in final-year projects showed no difference in project unit marks ($P<0.05$, $n=16$ students working in

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simulation, t-test) between students who have used the simulator versus other forms of project work such as laboratory and literature review projects.

CONCLUSION

We propose that projects utilising simulation are equally challenging for students as other forms of project and fulfil intended learning outcomes for degree programmes. Critically, they provide deep and exceptionally relevant learning opportunities for intercalating medical students who are the research-informed doctors of the future.

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REFERENCES

1 Department of health. Delivering high quality, effective, compassionate care: developing the right people with the right skills and the right values. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/310170/DH_HEE_Mandate.pdf (accessed 26 Jan 2018).
2 NHS England. News: NHS England's Sir Bruce Keogh sets out plan to drive seven-day services across the NHS. https://www.england.nhs.uk/2013/12/sir-bruce-keogh-7ds/ (accessed 26 Jan 2018).
3 Harris JR, Helyer RJ, Lloyd E. Using high-fidelity human patient simulators to teach physiology. *Med Educ* 2011;45:1159–60.
4 General Medical Council. Promoting excellence: standards for medical education and training. http://www.gmc-uk.org/education/standards.asp (accessed 26 Jan 2018).